CONTROL SYSTEM FOR MODERN HOUSE

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I declare that this thesis entitled "CONTROL SYSTEM FOR MODERN HOUSE" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

For more and more people, a control system has become a necessary part of their home and they wouldn't dream of living in a home without one. This trend can be directly traced from the life style and daily routine which is always busy with works. People nowadays always want something that can make their life easier. This project is proposed because it is believed that this project can make people life easier. This project is also quite interesting as it combines a lot of features such as lighting control module, mail notification module and door locking system. More important of this project is low cost. The basic idea for lighting control is when low light intensity occurs, the control circuit will turn on the light automatically. For mail notification, the basic idea is when owner received a new mail, the control circuit will play the voice message. Last but not least, the basic idea for door locking system is when owner want to go out and into the house, the door will open and close automatically.

ABSTRAK

Bagi kebanyakan orang, sistem kawalan telah menjadi satu keperluan yang penting untuk tempat tinggal dan mereka tidak pernah terfikir untuk hidup tanpanya. Tren ini boleh dikesan terus dari gaya hidup dan aktiviti harian yang selalu sibuk dengan kerja. Orang sekarang sentiasa mahukan sesuatu yang dapat memudahkan urusan di dalam hidup mereka. Projek ini diusulkan kerana percaya yang projek ini dapat memudahkan urusan mereka. Projek ini juga menarik kerana ia adalah hasil gabungan modul kawalan lampu, modul pemberitahu surat dan sistem pintu berkunci. Apa yang paling penting ialah perbelanjaan bagi projek ini adalah rendah. Idea awal bagi bagaimana modul kawalan lampu berfungsi ialah apabila keamatan cahaya rendah berlaku, litar kawalan akan menyalakan lampu secara automatic. Bagi modul pemberitahu surat, idea awal ialah apabila pemilik rumah menerima surat, litar kawalan akan memainkan mesej suara. Idea awal bagi sistem kunci pintu automatic ialah apabila pemilik rumah mahu keluar atau masuk ke dalam rumah, pintu akan buka dan tutup secara automatic.

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LIST OF ABBREVIATION

IR	Infra Red
CPU	Computer processing unit
RAM	Random access memory
ROM	Read only memory
MC	Microcontroller
LED	Light Emitted Diode
IC	Integrated circuit
DC	Direct Current
RPM	Revolution per minute
EEPROM	Electrically Erasable Programmable Read-Only Memory
EPROM	Erasable Programmable Read-Only Memory
COP	Computer Operating Properly
LCD	Liquid-crystal display
PIR	Passive Infra red
LDR	Light Dependent Resistor

CHAPTER 1

INTRODUCTION

1.1 Overview

The study design of automatic control systems, a field known as control engineering is a large and expensive area of study. Control systems and control engineering techniques have become a pervasive part of modern technical society. From simple devices as a toaster, to complex machines like space shuttles and rockets. Control systems are components that are added to other components to increase functionality or to meet a set of design criteria. Control engineering sometimes is a part of our everyday life. For more and more people, a control system has become a necessary part of their home and they wouldn't dream of living in a home without one. This trend can be directly traced from the life style and daily routine which is always busy with works. People nowadays always want something that can make their life easier.

This project comes out because it is believed that this project can make people life easier. This project is also quite interesting as it combines a lot of features such as lighting control, mail notification and door locking system. More important of this project is low cost. For lighting control system, Light Dependent Resistor (LDR) used as the sensor, potentiometer for LDR sensitivity and LM 741 used as the driver. The idea is when LDR received low light intensity, the driver circuit will switch on the

light automatically. The intensity of light at the LDR can be varying by using potentiometer. For mail notification system, a pair of infra red (IR) is used as the mail detector and speech circuit as the notifier. When the infra red beam between the transmitter and receiver cut off by the mail, the control circuit will switch on the speech circuit and play the voice message. For door locking system, a keypad and PIR motion sensor used as the input to open and close the door. To make the door open and close, stepper motor is used. The idea is owner need to press five digit codes on the keypad to open the door from outside the house. The door then will close automatically after a certain time. PIR motion sensor used to sense human appearance to open the door from inside the house. This project used a Motorola Microcontroller as the brain to operate the system.

1.2 Objective of the project

The objectives of this project are to develop a system that can:

i. Turn on light automatically when low light intensity occur
ii. Turn off light automatically when high light intensity occur
iii. Activate speech circuit to play voice message when receive a new mail
iv. Open or close the door automatically when someone in or out

1.3 Scope of the project

The scopes of this project are:

i. LED indicator/status of the system only can be seeing by owner when owner is at home
ii. All features will functioning when the system is working
iii. By assuming the modern house has their own backup generator/power, problem like blackout/no electricity not occur
iv. Using a Motorola Microcontroller (MC68HC11E1)

1.4 Problems statement

In recent years the energy crisis has become one problem which the whole world must confront. Home power consumption makes up the largest part of energy consumption in the world. In particular, the power consumption of lamps in a typical home is a factor which can't be ignored. The typical user needs different light intensities in different places. Sometimes the light intensity from outside is sufficient and thus we don't need to turn on any light. People sometimes lazy to switch off the light when woke up in the morning because they think it is not a big problem especially those who are late/in hurry to go to work. Sometimes the light still on even it is a day because nobody at home at that time to turn the light off. These factors cause energy waste. To let the electrical things switch on for a long time unattended could be a dangerous. People are also facing an acute shortage of electrical power these days, every now and then there is a power cut in some part of city. If a little power could be saving from the house, it could be utilized elsewhere. It could be a good contribution towards national development process.

Sometimes someone/owner that lives in a big house or multi-story buildings do not know he/she received a new mail because not realize the postman send the mail in a mailbox. Maybe at that time the owner were in the room or anywhere inside the house. Owner will never come to know that an urgent letter is lying in the mailbox, could it be an appointment letter or a call letter for interview or something like that. Let say if the owner receives very important mail that needs to reply or take action as soon as possible but does not know he/she has received that mail. Absolutely the owner will have a big problem and later the problem will affect his/her life.

So, this project is proposed to reduce or to fix the problem. The lighting control can turn on and off the light automatically based on sensitivity setting by the owner/user. By that way, owner/user does not have to trouble himself to switch on or off manually and at the same time, power consumption can be decreased. Mail notification can inform/notice the owner when he/she receives a new mail by playing a voice message that can be heard by entire house. So the owner will not miss the urgent letter again.

1.5 Thesis outline

This thesis consists of five chapters. Chapter 1 will discuss about the overview of the project, objective of the project, project scope and problem statement.

Chapter 2 contains a detail description of control system for modern house. It will explain about the concept of control system, the application of this system and the component that involved in this project.

Chapter 3 includes the project methodology. It will explain how the project planning and the flow of process in completing this project. The circuit design, software and hardware implementing are also discussed in this chapter.

Chapter 4 will discuss about the result and discussion. This chapter will show the result of this project step by step.

The last chapter contain the detail description about conclusion and recommendation. It concludes the whole project and gives a future recommendation to make this project perfect.

CHAPTER 2

LITERATURE REVIEW

A control system is a device or set of devices to manage, command, direct or regulate the behaviour other devices or systems. There are two common classes of control systems with many variations and combinations: logic or sequential controls and feedback or linear controls. Control system is a variable quantity or set of variable quantities is made to adapt to a prescribed norm. It either holds the values of the controlled quantities constant or causes them to vary in a prescribed way. A control system may be operated by electricity, mechanical, fluid pressure (liquid or gas) or a combination of means. When a computer is involved in the control circuit it is usually more convenient to operate all of the control systems electrically, although intermixtures are fairly common.

The new Lighting Control System (LCS) is a wall switch occupancy sensor that has been designed specifically for hotel environments to save energy while providing users a higher level of lighting amenity. The LCS has two key features that make it ideally suited for placement in hotel guestroom bathrooms. The first feature is that the LCS is preprogrammed with a timeout setpoint that is significantly longer than what is typically used by occupancy sensors. Findings from prior research conducted by LBNL and The Watt Stopper, Inc. suggested that most of the energy used by hotel bathroom luminaries is from the relatively infrequent periods when they are left on for very long periods of time (i.e. greater than four hours). By utilizing longer timeout setpoints (one hour for the LCS), these long periods can be eliminated

while greatly minimizing the chances of generating “false offs” in which the lights turn off when there is a guest in the bathroom[1].

The design proposed using both a microprocessor and light sensors for automatic room light detection and control. The Home Light Control Module (HLCM) which will be installed in every light fixture of a family is made up of four blocks: the pyroelectric infrared (PIR) sensor circuit, the light sensor circuit, the microprocessor and the RF module. By using the PIR sensor circuit, the HLCM detects if a human body enters the detection area or not. If there is no human body present, all controlled lights are turned off. If there is, the HLCM detects the light intensity under the environment and maintains sufficient light by controlling the number of lights [2]. A low power HLCM in every lamp installed in a typical home. The design detects whether someone is passing through the detection area not only by means of the PIR sensor in the HLCM but also by detecting the change of light intensity in a room by means of the light sensor in the HLCM. The RF module used to communicate among the HLCM to pre-control the lights. For example, when the room light intensity is insufficient all light controlled by HLCM A are turned on. HLCM A will the send a signal to the nearby HLCM B to turn on a light controlled by HLCM B to increase the light intensity. Moreover, if someone goes from the kitchen to the living room, the HLCM in the kitchen notifies the HLCM in the living room to turn on the light in advance [3].

Programmable electronic locks are a solid choice for facilities with a limited number of users and access points. A step above the traditional generations-old strictly mechanical pushbutton lock, programmable electronic locks are standalone, microprocessor-based, battery-powered locks that one can program up to 100 individual user codes, right at the keypad. Facilities managers or the office manager can add or delete users in seconds. Users' codes are typically kept between three to seven digits and entered via the keypad by the user to gain entry. There is no external wiring required and the locks will provide 80 000 plus activations or two to three years of use with common AA batteries.

The choice of lever for door should not be taken for granted. It is highly recommended that the exterior lever should swing freely in case intruders attempt to

break the door handle. The lever should only clutch when the electronic lock is provided a correct user code. Such programmable locks are now priced comparably with older mechanical and electrical keycode locks but can store many more codes. The significance of so many multiple codes should not be overlooked. If the lock has only one or a few codes, people must share codes. When an individual leaves the organisation and you need to change the code, all others sharing that code much also learn a new code. With nobody to notify, eliminating that ex-employee with the new breed of programmable electronic lock can be less than a ten-second procedure [4].

The detailed design of a microprocessor-based door lock system including the hardware design, software functional definitions, and diagnostics is presented. The system is designed in two modules: a door lock controller board, in which all functions necessary for keyless entry at a door are implemented, and a programming board. There is only one such board for the whole dwelling and it has additional hardware such as serial link interface circuitry and a display. The two modules are connected temporarily to perform keycode modification and diagnostic functions using a serial data link. The keycode is a four-character pattern. Authorized users of the dwelling are given this code and are required to enter this pattern via a keypad for entry. The number of integrated circuits used was kept to a minimum.